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09/584,025	05/30/2000	David J. Collodi	7871/4	1592

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EXAMINER	
SEALEY, LANCE W	

ART UNIT	PAPER NUMBER
2671	

DATE MAILED: 02/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)	
	09/584,025	COLLODI	
	Examiner	Art Unit	
	Lance W. Sealey	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,18-20,23-37,39-55,57-59,62-76 and 78-81* is/are rejected.

7)☒ Claim(s) *17,21,22,38,56,60,61 and 77* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Allowable Subject Matter

1. Claim 82 is allowed, and claims 17, 21-22, 38, 56, 60-61 and 77 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

2. The following is a statement of reasons for the indication of allowable subject matter: No prior art anticipates or suggests, in a method of generating a display comprising a plurality of pixels on a screen, in which, in the process of determining a specularity modulation value for a respective pixel, a second specular light intensity function value is obtained from a lookup table (claims 17, 38, 56, 77 and 82). Nor does any prior art anticipate or suggest, in a method of generating polygon surfaces in a rendering system for a display comprising a plurality of pixels, in the process of interpolating the specular light intensity functions using the specularity modulation value to obtain a composite specularity value, using an interpolated vector to address a color map for each pixel (claims 21 and 60), dividing, at each pixel, an interpolated three-dimensional vector by its largest component, and using the divided values of the other two components to address a two-dimensional color map for each pixel (claims 22 and 61).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth

> in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-5, 8-9, 11, 15, 18-19, 24-26, 29-30, 32, 36, 39-40, 42-44, 47-48, 50, 57-58, 63-65, 68-69, 71, 75 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama et al. ("Kazama," U.S. Pat. No. 5,835,220) in view of Knittel et al. ("Knittel," U.S. Pat. No. 6,342,885) and Wells et al. ("Wells," U.S. Pat. No. 5,253,339).

5. With respect to claims 1, 19, 40 and 58, Kazama, in disclosing a method and apparatus for detecting surface flaws, also discloses providing at least a pair of specular light intensity functions, wherein each specular light intensity function is representative of the specular light reflected by a respective pixel at a different surface reflectance characteristic (col.31, l.65-col.32, l.5). Note: for all practical purposes, claims 19, 40 and 58 are being treated like claim 1 in these rejections because if a display is generated (claim 1), a polygon surface is generated (claims 19 and 58), and in the case of claim 40, specular light is equivalent to color because color simply represents different levels of light.

6. However, Kazama does not disclose determining a specularity modulation value for a respective pixel by retrieving the specularity modulation value from a memory or interpolating the specular light intensity functions using the specularity modulation value to obtain a composite specularity value. These elements are disclosed by the Knittel method and apparatus

for illuminating volume data in a rendering pipeline at col.3, ll.58-63. The element of retrieving the specularity modulation value from a memory is disclosed at col.5, ll.27-34 (the specular reflection value is retrieved from a multiplier which presumably contains memory registers). In the case of claim 40, Knittel discloses retrieving the color modification value from a memory (lookup table) in col.2, ll.13-23.

7. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama method of providing specular light intensity functions with the Knittel methods of determining a specularity modulation value and interpolating specular light intensity functions. This would promote more realism in rendering by providing for modulated specular intensities (Knittel, col.3, l.60).

8. However, neither Kazuma nor Knittel disclose using said composite specularity value to modulate pixel color on a screen in a method of generating a display comprising a plurality of pixels on said screen. This is disclosed by the Wells method and apparatus for adaptive Phong shading at col.8, ll.11-14 (the Kazuma specular light intensity function and the Knittel specularity modulation value would replace the Wells reflection calculator **156** in ll.11-12, and it is known that transfer of pixels to a frame buffer is the last step before pixels appear on a screen).

9. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama-Knittel method of providing reflection calculation with

the Wells modulation of pixels on the screen. This would aid in rendering a quality image for the user (Wells, col.5, ll.22-23).

10. The other claims in this rejection will now be considered. With respect to claims 3-4, 23-24, 41-42 and 62-63, Knittel discloses scaling the interpolated specularity value by the modification value at col.3, ll.58-63.

11. Concerning claims 5-7, 26-28, 44-46 and 65-67, neither Kazama, Knittel nor Wells directly disclose scaling the interpolated specularity value by a derivative of the modulation value (claims 5, 26, 44 and 65), or maximum, minimum or intermediate reflectivity functions (claims 6-7, 27-28, 45-46 and 66-67). However, scaling the interpolated specularity value by a derivative of the modulation value is obvious because once a method of obtaining the modulation value is arrived at, the modulation value can be any number, and in the case of the reflectivity function of claims 6-7, 27-28, 45-46 and 66-67, the examiner is interpreting the reflectivity function to be, for all practical purposes, the same as the modulation value because the applicant's specification states that the specularity modulation value "simulates reflectivity" (p.2, ll.6-8, 18-19).

12. Regarding claims 8, 29, 47 and 68, Knittel renders obvious the step of determining the specularity modulation value in col.3, ll.42-44 because there must be at least one "procedural calculation" being done in the Knittel gradient magnitude modulation unit in order to determine the specularity modulation value.

13. With respect to claims 9, 11, 15, 30, 32, 36, 48, 50, 69, 71 and 75, Knittel renders obvious a calculation based on surface offset coordinates in the step of determining the specular modulation value (claims 9, 30, 48 and 69), assigning a pair of surface coordinates for each pixel and using the surface coordinates as inputs (claims 11, 32, 50 and 71), and using at least one surface value for a respective pixel as an input to the procedural calculation (claims 15, 36 and 75) in the eighth sentence of the Abstract: combining the specular intensity with the specular modulation factor creates an additional specular intensity at another pixel, which is an offset distance from the pixel for which the first specular intensity was calculated.

14. Finally, concerning claims 18, 39, 57 and 78, Kazama discloses determining a specular light intensity function at col.31, l.65 to col.32, l.5, and Knittel discloses deriving the value of another specular light intensity function from the first specular light intensity function at col.3, ll.58-62.

15. Therefore, in view of the foregoing, claims 1, 3-5, 8-9, 11, 15, 18-19, 24-26, 29-30, 32, 36, 39-40, 42-44, 47-48, 50, 57-58, 63-65, 68-69, 71, 75 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama, Knittel and Wells.

16. Claims 2, 23, 41 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama in view of Knittel and Wells and further in view of Jaeger et al. ("Jaeger," U.S. Pat. No. 5,936,613).

17. With respect to all four claims, providing at least a pair of specular light intensity

functions by providing a maximum specular light intensity function and a minimum specular light intensity function is disclosed by the Jaeger system with changeable graphics in col.18, ll.47-59 (the minimum specular light intensity function is the point on the band at which reflectivity is at a minimum, and the maximum specular light intensity function is the point on the band at which reflectivity is at a maximum).

18. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama-Knittel-Wells method of generating a display with the Jaeger ability to provide maximum and minimum specular light intensity functions. The ideal position for an object depends on where that object reflects light (Jaeger, col.18, l.64-col.19, l.3).

19. Accordingly, in view of the foregoing, claims 2, 23, 41 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama, Knittel, Wells and Jaeger.

20. Claims 10, 31 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama in view of Knittel and Wells and further in view of Laferriere (U.S. Pat. No. 6,226,005).

21. Before the first Office action, claims 10, 31 and 47 were drafted similarly. The amendment to which this Office action is a response amends claim 10, but not claims 31 and 47. For the purposes of this Office action, the current claims have been examined as if the applicant intended to amend claims 31 and 47 so that these claims resemble claim 10.

22. Neither Kazama, Knittel nor Wells disclose, with respect to all three claims, determining the specularity modulation value by retrieving the specularity modulation from a two-

dimensional map contained in a texture memory. However, this element is disclosed by the Laferriere method and system for determining and/or using illumination maps in rendering images at the third sentence of the Abstract.

23. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama-Knittel-Wells method of generating a display with the Laferriere ability to determine the specularity modulation. This eliminates the necessity for the rendering engine to avoid having to calculate the contributions of lights in the scene during rendering, thus reducing the rendering time (Laferriere, Abstract, second sentence).

24. Accordingly, in view of the foregoing, claims 10, 31 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama, Knittel, Wells and Laferriere.

25. Claims 12-13, 33-34, 51-52 and 72-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama in view of Knittel and Wells and further in view of Moller et al. ("Moller," Real-Time Rendering).

26. With respect to all claims, Moller discloses using the surface coordinates as inputs to a function that generates bump map values for each respective pixel (claims 13, 34, 52 and 73), and, since bump map values are texture map values, texture map values for each respective pixel (claims 12, 33, 51 and 72), from the second paragraph of p.137 to p.138: the surface coordinates are *x, y, z* vectors.

27. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama-Knittel-Wells method of generating a display with the Moller bump map generation. Making part of an image appear uneven fosters image realism (Moller, p.136, section 5.7.5, first paragraph).

28. Accordingly, in view of the foregoing, claims 12-13, 33-34, 51-52 and 72-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama, Knittel, Wells and Moller.

29. Claims 14, 16, 35, 37, 53, 55, 74 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama in view of Knittel and Wells and further in view of Parikh et al. ("Parikh," U.S. Pat. No. 6,175,367).

30. Parikh, in disclosing a method and system for real time illumination of computer generated images, also discloses, with respect to claims 14, 35, 53 and 74, specifying a specular exponent value for at least one of the pair of specular light intensity functions at col.4, ll.42-48 and 56-63. Every specular light intensity function, represented by a vertex, will have a specular exponent. Therefore, any time the specular modulation value is calculated between two specular light intensity functions, both specular light intensity functions will have a specular exponent value.

31. Accordingly, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama-Knittel-Wells method of generating a display with the

Parikh method of shading calculations. Parikh allows Kazama-Knittel-Wells to reduce resource intensive calculation in shading (Parikh, col.4, ll.23-26).

32. The other claims in the rejection will now be considered. With respect to claims 16, 20, 37, 55, 59 and 76, Parikh discloses using at least one light source value for a respective pixel as an input to the at least one procedural calculation (claims 16, 37, 55 and 76), and assigning a unique modulation value at each of the polygon's vertices, rasterizing the polygon surface and interpolating the modulation values at the vertices throughout the rasterized polygon surface to provide a modulation value for each pixel (claims 20 and 59) at col.4, ll.51-60. The specularity modulation value is "the difference term at the pixel."

33. Accordingly, in view of the foregoing, claims 14, 16, 35, 37, 53, 55, 74 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazama in view of Knittel, Wells and Parikh.

34. Claims 79-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moller in view of Laferriere, Knittel, Parikh and Jaeger.

35. With respect to both claims, Moller further discloses generating a polygon surface represented by a plurality of vectors for each pixel in said plurality of pixels, the vectors including a light source vector, a surface normal vector and a view vector in Section 4.3.2, pp.73-77.

36. However, Moller does not disclose determining, in real time, using one or more values

from a map to determine a reflectivity of the polygon surface for a respective pixel in the polygon and using the determined reflectivity to calculate the specular reflection (specular light intensity function) at the respective pixel in the polygon. Laferriere discloses determining a reflectivity of the polygon surface for a respective pixel in the polygon in real time using one or more values from a map at col.15, ll.34-42.

37. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-disclosed vectors with the Laferriere method of determining reflectivity. This eliminates the necessity for the rendering engine to avoid having to calculate the contributions of lights in the scene during rendering, thus reducing the rendering time (Laferriere, Abstract, second sentence).

38. However, neither Moller nor Laferriere disclose using the determined reflectivity to calculate the specular reflection at a vertex of the polygon. This is disclosed by Knittel at col.3, ll.58-63.

39. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Laferriere method with the Knittel method of determining reflectivity. This would promote more realism in rendering by providing for modulated specular intensities (Knittel, col.3, l.60).

40. However, neither Moller, Laferriere nor Knittel disclose using the determined reflectivity to calculate the specular reflection at the respective pixel in the polygon. This is disclosed by Parikh at col.4, ll.51-60.

41. Accordingly, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Laferriere-Knittel method with the Parikh method of shading calculations. Parikh allows Moller-Lafierre-Knittel to reduce resource intensive calculation in shading (Parikh, col.4, ll.23-26).

42. However, neither Moller, Laferriere, Knittel nor Parikh disclose calculating the specular reflection using two or more specularity functions. This element is disclosed by Jaeger at col.18, ll.47-59 (the minimum specular light intensity function is the point on the band at which reflectivity is at a minimum, and the maximum specular light intensity function is the point on the band at which reflectivity is at a maximum).

43. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Lafierre-Knittel-Parikh method with the Jaeger ability to provide maximum and minimum specular light intensity functions. The ideal position for an object depends on where that object reflects light (Jaeger, col.18, l.64-col.19, l.3).

44. Accordingly, in view of the foregoing, claims 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moller, Lafierre, Knittel, Parikh and Jaeger.

Remarks

45. This Office action constitutes a non-final rejection because the allowability of claims 10, 31 and 49 has been withdrawn despite a non-material amendment to claim 10.

Conclusion

Any inquiry concerning this communication or earlier communications from the Office should be directed to the examiner, Lance Sealey, whose telephone number is (703) 305-0026. He can be reached from 7:00 am-3:30 pm Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

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or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office at (703) 306-0377.

Respectfully submitted,

Lance W. Sealey

Lance W. Sealey, examiner